Russian River Estuary Sandbar Breaching Monitoring Plan

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September 2005

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Background

The Russian River estuary (Estuary) is located about 97 kilometers (km; 60 miles) northwest of San Francisco in Jenner, Sonoma County, California (Figure 1). The Russian River watershed encompasses 3,847 km^2 (1,485 square miles) in Sonoma, Mendocino, and Lake counties. The Estuary extends from the mouth of the Russian River upstream approximately 10 to 11 km (6 to 7 miles) between Austin Creek and the community of Duncans Mills (Heckel 1994). The Estuary is constrained by the narrow valley walls in the lower reach of the Russian River. Coastal and valley freshwater marsh, non-native annual grasslands, and north coast riparian scrub are the dominant terrestrial habitats in the Estuary. The valley walls are vegetated by coastal terrace prairie, redwood and Douglas fir forests, and riparian scrub (Heckel 1994).

Breaching Activities

The Estuary closes throughout the year as a result of a sandbar forming at the mouth of the Russian River. The sandbar usually closes during the spring, summer, and fall when river flows are relatively low and long period waves transport sand landward, rebuilding the beach that was removed by winter waves and river outflows (Heckel 1994). Closures result in ponding of the Russian River behind the sandbar and water level increases in the Estuary. Natural breaching events occur when estuary water surface levels exceed the sandbar height and overtop the sandbar, scouring an outlet channel. The Sonoma County Water Agency (Agency) mechanically breaches the sandbar to alleviate potential flooding of low-lying shoreline properties near the town of Jenner. Breaching is performed in accordance with the *Russian River Estuary Study 1992-1993* (Heckel 1994) when the Estuary water surface level is between 1.4 and 2 meters (m; 4.5 and 7.0 feet) as read at the Jenner gage (located at the Jenner Visitor's Center).

Breaching activities occur on the closed sandbar. The sandbar is accessed from the paved parking lot at Goat Rock State Beach, located at the end of Goat Rock Road off of Highway 1. Equipment is off-loaded in the parking lot and driven onto the beach via an existing access point. A bulldozer or similar equipment is used to breach the sandbar. A cut in the sandbar is created at a sufficient depth to allow river flows to begin transporting sand to the ocean. The sand is placed onto the beach adjacent to the pilot channel. After the pilot channel is dug, the last upstream portion of the sandbar is removed, allowing river water to flow to the ocean. The size of the pilot channel varies depending on the height of the sandbar to be breached, the tide level, and the water surface level in the Estuary. A typical channel would be approximately 30 m long, 8 m wide, and 2 m deep (100 feet long, 25 feet wide, and 6 feet deep). The amount of sand moved can range from less than 100 cubic yards to approximately 1,000 cubic yards. The Agency contacts State Parks lifeguards within 24 hours prior to breaching activities to minimize potential hazards to beach visitors. Signs and barriers are also posted for 24 hours prior to and after breaching events to warn beach visitors of the hazards of the breaching area.

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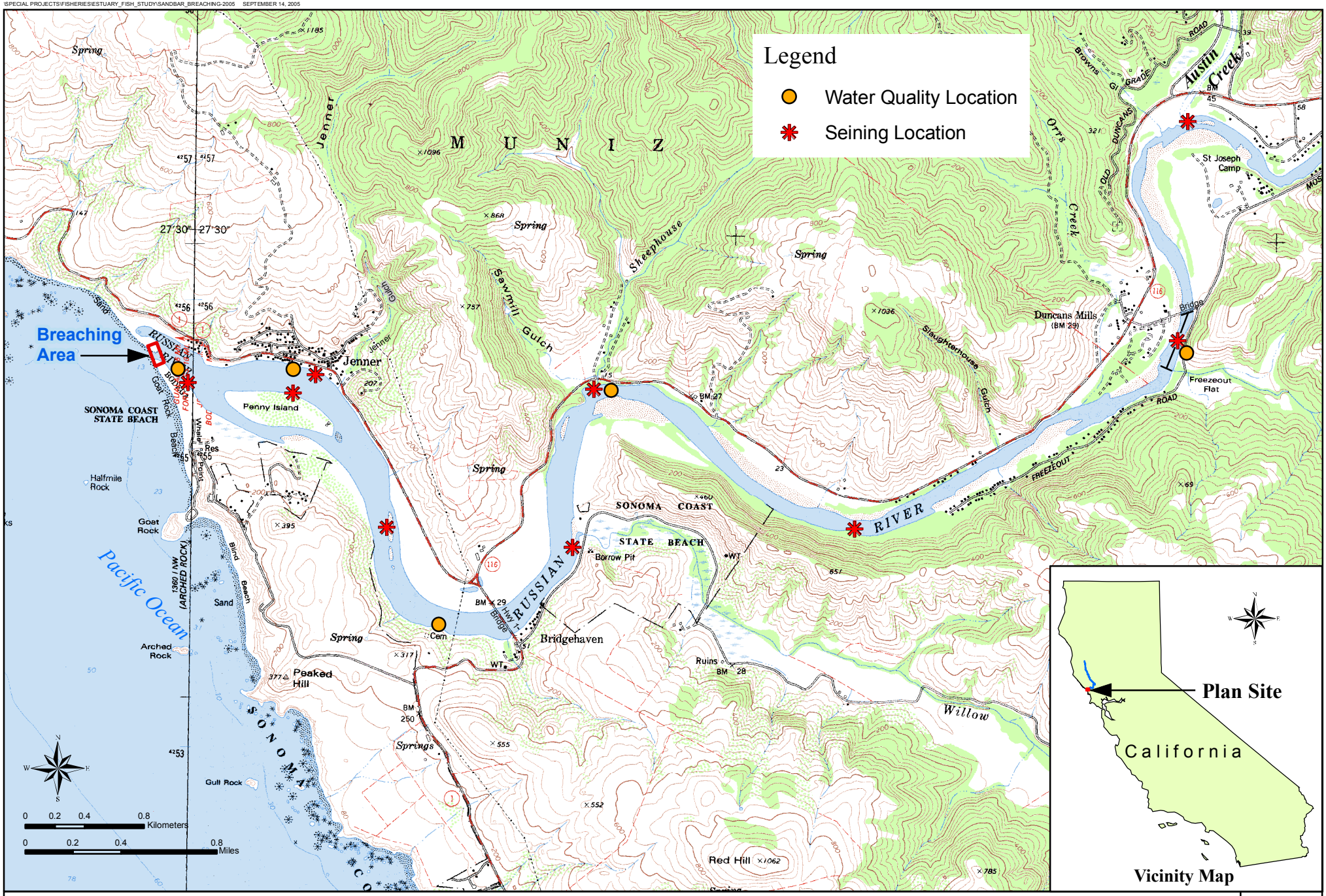

Russian River Estuary
Sandbar Breaching Monitoring Plan

This Map is for general reference only.

Figure 1

Previous Monitoring Efforts

The Agency monitored biological and water quality conditions before, during, and after breaching events from 1996 to 2000. Five years of monitoring demonstrated that near-bottom layers of the Estuary water column often become anoxic within a few days of sandbar closure. Anoxic conditions at the near-bottom were also observed when the sandbar was open during neap tides or during low river flows. Once the Estuary is breached, it may take more than one tidal cycle for dissolved oxygen (D.O.) levels in the near-bottom layers to increase at the upper end of the Estuary. Breaching the sandbar improves water quality conditions in the Estuary and restores pre-closure conditions. Artificial breaching occurs when water levels reach 2 m (7.0 feet) at the Jenner gage. Breaching the Estuary at levels greater than 2.4 m (8.0 feet) floods the Willow Creek marsh, which becomes anoxic during summer months due to low water inflow and high biochemical oxygen demand, and results in the subsequent draining of the poor quality water into the Estuary (Sonoma County Water Agency and Merritt Smith Consulting 2001). Draining of the marsh previously resulted in a series of fish and macroinvertebrate mortalities at the confluence of Willow Creek and the Estuary.

Harbor seals (*Phoca vitulina*) regularly hauled out at the mouth of the Russian River, with the greatest numbers observed in late winter and mid-summer. California sea lions (*Zalophus californianus*) and elephant seals (*Mirounga angustirostris*) were occasionally observed at the river mouth. In all five years of monitoring, the number of pinnipeds hauled out at the mouth of the Estuary declined when the sandbar was closed and increased soon after it was breached (Sonoma County Water Agency and Merritt Smith Consulting 2001). Seals at the haulout responded most negatively to human disturbances on the beach (typically beach visitors approaching the haulout). When approaching the breaching location, Agency crews walked ahead of the bulldozer to ensure that no pinnipeds were on the beach. Pinnipeds typically abandoned the haulout prior to the bulldozer reaching the breaching location due to disturbance from visitors prior to crews arriving onsite. Once breaching was completed, equipment and crews left the beach and pinnipeds returned to the haulout soon after.

Macroinvertebrate species commonly observed were *Neomysis mercedis* (opossum shrimp), *Crangon franciscorum* (bay shrimp), *Cancer magister* (Dungeness crab), *Eogammarus confervicolus* (amphipods), and sphaeromatid isopods.

Forty-seven fish species were observed in the Russian River Estuary during the five years of monitoring (Sonoma County Water Agency and Merritt Smith Consulting 2001). Topsmelt (*Atherinops affinis*), starry flounder (*Platichthys stellatus*), staghorn sculpin (*Leptocottus armatus*), prickly sculpin (*Cottus asper*), threespine stickleback (*Gasterosteus aculeatus*), and shiner surfperch (*Cymatogaster aggregate*) were commonly captured. Results indicate that fish species diversity and abundance was driven more by seasonal variability than by sandbar conditions (open versus closed). Estuarine fishes were more abundant during spring and summer months when they entered the Estuary to spawn and rear. Species diversity and abundance declined during the fall months when fish left the Estuary, possibly due to unfavorable thermal conditions (Merritt Smith Consulting 2000).

Presence of Salmonids

Three federally-listed salmonids are found in the Russian River watershed: central California coast steelhead (*Oncorhynchus mykiss*), California coastal Chinook salmon (*O. tshawytscha*), and central California coast coho salmon (*O. kisutch*).

Central California coast steelhead occur in all of the major tributaries, and most of the smaller ones, in the Russian River watershed (Merritt Smith Consulting 2000). Steelhead use the lower and middle mainstem Russian River primarily for migration to and from spawning and nursery areas in the tributaries and the mainstem above Cloverdale. However, some rearing occurs in the mainstem before smolt outmigration.

The historic extent of naturally occurring California coastal Chinook salmon in the Russian River watershed is debated. However, Chinook currently spawn in the mainstem above Healdsburg and in larger tributaries such as Dry Creek (Merritt Smith Consulting 2000).

The central California coast coho salmon are less abundant than steelhead or Chinook salmon in the Russian River watershed (ENTRIX, Inc. 2001). Currently, spawning and rearing occurs in a few tributaries of the lower Russian River.

The Russian River estuary is important for adult and juvenile passage for all three listed salmonids (ENTRIX, Inc. 2001). The Estuary provides an opportunity for smolts to acclimate to ocean conditions before migrating out of the Russian River, as well as potentially providing rearing habitat for steelhead and Chinook salmon. Steelhead were captured in the Estuary during each of the five monitoring years. Chinook salmon were captured in two of the five monitoring years.

Goals and Objectives

Breaching the Estuary sandbar requires permits from state and federal regulatory agencies, including the U.S. Army Corps of Engineers (Corps). The Corps initiated consultation with the National Marine Fisheries Service (NMFS) under the Endangered Species Act to determine if issuing a permit for the Agency's breaching activities would be likely to affect listed salmonids. NMFS issued a Biological Opinion stating that the proposed estuary breaching is not likely to jeopardize the continued existence of the listed salmonids and requiring the Agency to develop an estuary monitoring plan (National Marine Fisheries Service, Southwest Region 2005).

In accordance with the Biological Opinion, the goals of this monitoring plan are to:

- document the distribution, abundance, and condition of listed salmonids in the Russian River estuary;
- document salmonid residence times in the Estuary;
- and to assess the habitat parameters that affect salmonid presence and distribution in the Estuary.

Monitoring salmonid occurrences and habitat parameters in the Estuary would provide information regarding the presence of non-salmonid species and changes in water quality conditions related to changes in sandbar closure. This information may be used to further assess potential affects of current and future management on wildlife, fisheries, and habitat characteristics of the Estuary.

Monitoring Components

The Agency will monitor water quality and fisheries in the Estuary to meet the plan's goals and objectives. These variables will provide information on suitability of water quality for salmonids and document the distribution and timing of salmonid use of estuarine habitats during the period of most frequent sandbar closure.

Methods may be revised as data are collected and evaluated in the field. The methods discussed in the following section will also provide information on distribution, composition, and timing of non-salmonid fishes in the Estuary.

Schedule

This monitoring plan will be implemented from 2005 through 2010. Monitoring would generally begin in mid-April to late May (once river flows have declined to safe levels) and continue through fall.

Water Quality Methods

Estuary water quality will be monitored during the spring, summer, and fall using multi-parameter, continuously-recording YSI 6600 water quality meters (sondes). Deployment would occur once river flows and turbidity have declined to safe levels (mid-April to early May in most years). Sondes would be retrieved prior to the onset of winter rains (by early November in most years).

Sondes would be deployed at multiple stations in the Estuary (e.g. mouth of the Russian River, Penny Island, and Bridgehaven, Figure 1). Stations would be located as close as possible to fisheries seining stations (see Fisheries Methods below) and would either be located in a deep pool or near a tributary. Stations in the deepest locations would consist of a concrete anchor attached to a steel cable suspended from the surface by a large buoy and an array of sondes. Sondes in the array would be attached to the cable and record water quality conditions at near bottom, mid-depth, and the surface (within 1 meter) of the water column. Some stations that are in more shallow locations may consist of one or two sondes, depending on water depth, that are cabled to the bank. Each station would be located in the deepest part of the channel to capture the fullest water quality vertical profile. The placement of sondes vertically at each station will also track anoxic events and determine if salinity or temperature stratification is present. Calibration would occur every three weeks and data would be downloaded and sondes cleaned during each event.

Sondes would collect hourly water temperature (degrees Celsius), D.O. (milligrams per liter), salinity (parts per thousand), pH, and specific conductance (mho). Monitoring these variables will show how water quality changes with sandbar conditions and how this may affect salmonid habitat in the Estuary.

Fisheries Methods

A purse seine will be used to determine the relative abundance and distribution of salmonids and other near-shore fishes. Seining would begin once river flows have declined to safe levels (mid-April to early May in most years). Sampling would continue at least every three weeks through early fall. Sandbar closures occur most frequently during this time period under current minimum instream flows.

Nine sampling stations would be located throughout the Estuary. These sites would characterize aquatic habitats present in the Estuary including features such as substrate (e.g. mud, sand, and gravel), water depth, and tidal and creek tributary influences (Figure 1; Cook 2005). Near-shore fisheries would be sampled using a 30-m-long (100-foot-long) and 3-m-deep (10-foot-deep) purse seine. A crew of four will deploy the seine using a boat to pull one end offshore and then around in a half-circle while the other end is held onshore. Three seine pulls will occur at each sampling location. Captured fish will be placed in an aerated bucket, identified, and counted prior to release. Non-salmonid voucher specimens may be preserved for later identification. Salmonids captured will be anesthetized, measured, weighed, and examined (for life history stage and identification as wild or hatchery stock) in accordance with the Agency's Endangered Species Act scientific research Section 10(a)(1)(A) permit. Fish will be allowed to recover in aerated buckets prior to release.

Water quality data will be collected at 0.5 m intervals at the approximate center of each sampling station prior to seining. A handheld YSI meter would collect water temperature, salinity, and D.O. A Secchi disc would be used to measure turbidity (Cook 2005).

Seining would measure the geographic distribution of salmonids and other fishes in the Estuary and provide data to evaluate distribution trends over multiple years.

Juvenile Steelhead Residency Pilot Study

A two-year pilot study will be implemented to evaluate the effectiveness of using acoustic telemetry and passive integrated transponder (PIT) tags to monitor juvenile steelhead summer residency in the Estuary. The purpose of the study is to determine the distribution and residence times of juvenile steelhead within the Estuary and to gain an understanding of how sandbar and water quality conditions may influence their presence and behavior (Fuller and Manning 2005).

Acoustic transmitters (tags) would be implanted into 40 steelhead captured by beach seine in the Estuary. To minimize behavioral effects of the tags, fish weighing greater than 45 g would be selected. Individuals would be handled in accordance with the Agency's Endangered Species Act scientific research Section 10(a)(1)(A) permit and the methods detailed in Fuller and Manning (2005).

Tagged fish would be monitored by fixed and manual tracking. Three fixed receiving stations would be located in the upper, middle, and lower reaches of the Estuary. Stations would consist of two hydrophones (an underwater microphone that detects transmitter signals) and a datalogging receiver (for amplifying, filtering, and decoding signals). The receivers would

record the time and direction of tagged fish moving past the stations. Tagged fish would also be manually tracked from a boat by 24 hour continuous tracking and period of day tracking. Continuous tracking would occur biweekly and follow a subset of randomly selected fish by locating and relocating individuals every hour over a 24-hour period. Period of day tracking would occur monthly from Austin Creek to the mouth of the river over four consecutive days. Each day would represent one of the following time periods: morning (0400-0900), afternoon (1100-1500), evening (1500-2000), and night (2100-0200). Lunar phase, tidal direction, water quality (D.O., temperature, and salinity), and depth where fish are detected would be recorded during all manual tracking surveys.

Reporting

An annual report will be prepared and distributed to the Corps, NMFS, California State Lands Commission, and North Coast Regional Water Quality Control Board.

The annual report will include an executive summary, monitoring methodology, tabulation of breaching events, summary of monitoring results, and discussion of problems noted and proposed remedial measures. The tabulation of breaching events will include the following information for each event: approximate sandbar closure date; approximate number of sandbar closure days prior to the breaching event; breaching event date; and the recorded estuary water level on the breaching event date. The summary of monitoring results will include a summary of water quality trends observed, a list of fish species observed (including locations, weights, and lengths of salmonids captured), a summary of fisheries geographic distribution trends observed, and summary of water quality recorded. A discussion of problems identified during monitoring and proposed measures to remediate them will allow the Agency to determine the effectiveness and efficiency of this monitoring plan and to make improvements in assessing the habitat parameters that affect salmonid use of the Estuary.

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